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ABSTRACT

Academic departments exert a powerful influence on students by recruitment of distinctive personality types into academic disciplines, and by a socialization process in which departments reward students for the display of attitudes in accordance with the norms of their disciplines. This study examined the differential patterns of student growth within the theoretical framework of Holland's theory of occupational choice using data on 2,036 students from the 1986 and 1990 surveys of the Cooperative Institutional Research Program. Holland classifies people into six personality types based upon their distinctive patterns of interests, attitudes, and competencies, and proposes a model of six types of environments that attract, reinforce and are dominated by each personality type. It was predicted that students would show differences dependent on their involvement in different academic subenvironments classified according to Holland's model. This study strongly supported Holland's theory, showing wide variation in students' self-reported patterns of growth over a four-year period as a function of the specific academic subenvironment within the institution. Results support the use of Holland's theory to examine the contribution of different instructional approaches to students' development. Tables give statistical data and a description of the model academic subenvironments of Holland's theory. (Contains 37 references.) (PRW)

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ACADEMIC SUBENVIRONMENTS AND DIFFERENTIAL PATTERNS OF SELF-PERCEIVED GROWTH DURING COLLEGE: A TEST OF HOLLAND'S THEORY

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ACADEMIC SUBENVIRONMENTS AND DIFFERENTIAL PATTERNS OF SELF-PERCEIVED GROWTH DURING COLLEGE: A TEST OF HOLLAND'S THEORY

(Abstract)

Differential patterns of college students' self-perceived growth are examined within the framework of Holland's theory of vocational choice/personality. The findings support the fundamental premises of the theory. Implications of the potential of the theory to promote students' learning and cognitive development are discussed.

ACADEMIC SUBENVIRONMENTS AND DIFFERENTIAL PATTERNS OF SELF-PERCEIVED GROWTH DURING COLLEGE: A TEST OF HOLLAND'S THEORY

(Revised: June 20, 1996)

While there are many sources of influence on student growth within specific collegiate settings, one of the most powerful is the academic department (Feldman & Weiler, 1976; Walsh, Vaudrin, & Hummel, 1972; Weidman, 1989). Parsons and Platt (1973) explained that academic departments are a powerful source of normative influence on students because of the ability of faculty to differentially reward students for their performance through the assignment of grades and the encouragement of social interaction. Similarly, Vreeland and Bidwell (1966) noted that academic departments possess powerful normative and utilitarian sanctions for the socialization of students manifested through the expressed goals of faculty for undergraduate education. Kelly and Hart (1971) and Lipset and Ladd (1971) interpreted the strong influence of academic departments on student growth as the consequence of an underlying selective recruitment process of distinctive personality types into academic disciplines that have prevailing orthodoxies, biases, and definitions of the right way to think and act.

Theoretical Framework

The central purpose of this paper is to examine the differential patterns of student growth within the theoretical framework of Holland's (1966, 1973, 1985) theory of vocational choice/personality. Holland's theory assumes that most people can be classified as one of six personality types (realistic, investigative, artistic, social, enterprising, and conventional) based upon their distinctive patterns of interests, attitudes, and competencies. Six analogous model environments are also proposed that reflect the prevailing physical and social settings in society with each model environment hypothesized to attract and to be dominated by its associated personality type. That is, investigative environments attract and are dominated by investigative types, whereas enterprising environments attract and reflect the characteristic interests, attitudes, and competencies of enterprising types.

Holland (1985) further proposes that model environments reinforce and reward the characteristic patterns of interests, attitudes, and competencies of their associated personality types. This socialization occurs through environmental efforts to stimulate the performance of distinctive activities, to promote the development of unique competencies, to encourage individuals to see themselves as possessing preferred values, and to reward them for the display of distinctive behavioral patterns. For example, investigative environments emphasize the performance of activities involving the systematic study of phenomena, promote the acquisition of scientific and mathematical competencies, and encourage members to see themselves as self-confident scholars and intellectuals; whereas enterprising environments emphasize activities entailing the manipulation of others, promote the cultivation of persuasive and interpersonal competencies, and encourage members to see themselves as aggressive, self-confident individuals with leadership and public speaking ability.

Holland's theory was selected as the theoretical framework of the current study because of its respect in the scholarly community and its validity in characterizing differences across dissimilar academic disciplines. For example, Holland's theory received the highest rating in a comparison with five comparable theories based on Walsh's (1973) assessment of six attributes of formal theories (i.e., comprehensiveness, clarity and explicitness, operational adequacy, incorporation of known findings, parsimony, and generation of empirical research). In addition, Holland's 1973 book, Making Vocational Choices, achieved the distinction of a "citation classic" in the social and behavioral sciences based on the frequency of its citations in the Science Citation Index and the Social Science Citation Index (Institute for Scientific Information, 1980). The merits of Holland's theory have also been noted by Baird (1988) in his exhaustive review of research findings on college environments in which he concluded that only the theoretical propositions of Holland (1973) and Barker (1968) provide a basis for understanding and explaining why students change during their collegiate experience.

The utility of the theory in studying the diversity of academic disciplines between and within institutional settings is substantial. Holland's theory has been used to examine differences

in the overall campus environments of two- and four-year institutions of higher learning in the United States, Japan, and the British Commonwealth (Richards, 1973; Richards, 1974). More germane to the focal interests of the current study are extant research findings indicating that the distribution of faculty members in Holland's six model subenvironments within individual institutions is related in a theoretically predictable manner to variation in classroom learning climates (Astin, 1965; Hearn & Moos, 1978); life histories and college experiences of students (Smart, 1989); academic department goals (Smart and Mclaughlin, 1974); faculty teaching goals and instructional methods (Peters, 1974; Smart, 1982); and the duties performed by and the sources of job satisfaction of academic department heads (Smart, 1976).

The current study represents a longitudinal investigation of the differential patterns of college students' growth within the context of Holland's (1966, 1973, 1985) theory of vocational choice/personality. Given the premise of Holland's theory that the different model environments reinforce and reward different interests, attitudes, and competencies, we would expect students growth to be different as a result of their exposure to and involvement in these different subenvironments of colleges and universities. Furthermore, we would expect those differences to be consistent with the premises of Holland's theory. Finally, the current study examines the extent to which such differences among the subenvironments are consistent across dissimilar types of colleges and universities.

Research Procedures

Sample. Data for this study were obtained from the 1986 and 1990 surveys of the Cooperative Institutional Research Program (CIRP) sponsored by the Higher Education Research Institute at the University of California, Los Angeles. The overall sample consisted of 4,408 students attending 360 different institutions of higher learning. Students completed the standard CIRP freshman survey upon entering college in the fall of 1986 and a follow-up survey in the winter of 1990. The latter survey obtained information about students' actual college experiences and perceptions of their growth during the intervening four years.

This study was based on the responses of 2,036 students who attended a single four-year institution for all four years, whose academic major was included in the classification of Holland's subenvironments, and who provided complete information for all variables described below. We restricted the sample to those attending a single four-year institution for all four years for two reasons: first, to provide some control for the amount of exposure students had to the subenvironments; second, the dataset contained an institutional identification (i.e., Carnegie type) for only the institution attended in 1986 and we were interested in determining the extent to which differences in student growth patterns were consistent across different types of institutions. Whereas there was a fairly even balance between male (47%) and female (53%) students, 90% of the students reported their ethnic identity as "white/caucasian".

Variables

Holland Subenvironments. The 1986 freshman survey asked students to select their "probable field of study" and the 1990 follow-up survey asked students to select their "current/last field of study" from a listing of 80 academic disciplines/majors. These academic majors were classified into the six academic subenvironments proposed by Holland using The College Majors Finder (Rosen, Holmberg, Holland, 1989). A total of 72 of the 80 majors could be classified using The College Majors Finder. However, the Realistic and Conventional subenvironments had a total of only four academic majors and were subsequently not included in the study because they had too few students for the results of the analyses to be considered reliable. Table 1 presents a list of representative academic majors assigned to the four remaining subenvironments proposed by Holland (i.e., Investigative, Artistic, Social, Enterprising), as well as a description of the typical activities, competencies, and values that each is hypothesized to promote, reinforce, and reward. The number of students in each of the four academic subenvironments was: Investigative (n = 602, 30%), Artistic (n = 275, 13%), Social (n = 730, 36%), and Enterprising (n = 429, 21%).

(Insert Table 1 about here)

Weidman (1989) noted that academic subenvironments (i.e., departments) are "a particularly important locus of both faculty and peer influences on students" (p. 306) and included them as an integral component in his conceptual model of undergraduate socialization. He cautioned, however, that investigators must take into consideration the duration of their influence since Curtis (1974) has shown that the socializational potential of educational settings increases with the amount of time that students are exposed to those settings. As a partial control for this consideration, the duration of students' exposure to and involvement in the four academic subenvironments was considered by distinguishing between students whose 1990 and 1986 declared majors were the same (n = 1,038, 51%), and those whose declared majors in 1990 were different from their intended majors in 1986 (n = 998, 49%).

Carnegie Institutional Classification. The dataset included the Carnegie institutional classification for the institutions students attended in 1986. The following threefold classification of institutions was used to discern if differences among the four Holland subenvironments were true across different institutional settings: Research and Doctoral-Granting Universities (n = 692, 34%), Comprehensive Colleges and Universities (n = 753, 37%), and Liberal Arts Colleges (n = 591, 29%).

Self-perceived Student Growth Items. The 1990 follow-up survey asked students to indicate their growth between 1986 and 1990 in 20 different areas. The specific instructions were: "Compared with when you entered college as a freshman, how would you now describe your:". A five point response scale was used with 5 = "much stronger," 4 = "stronger," 3 = "no change," 2 = "weaker," and 1 = "much weaker". Two of the 20 items were deleted because there was no theoretical basis for assuming that they would distinguish between students in the four academic subenvironments proposed by Holland. For example, the two items concerned

students' growth in the acquisition of "foreign language ability" and "religious beliefs and convictions". The remaining eighteen items are shown in Table 3.

1986 Precollege Characteristics. Given Holland's (1985) premise that "people search for environments that will let them exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles" (p. 4) and the abundant evidence supporting this proposition (see Holland, 1985), it was necessary to control for differences in students' entering interests and abilities in order to have confidence that any subsequent differences among those in the four academic subenvironments were a function of the socialization processes of those subenvironments. Items from two sets of questions in the 1986 CIRP freshman survey were used for this purpose. The 1986 freshman survey asked students to rate themselves in terms of 12 different abilities (e.g., mathematical ability, social self-confidence) and to indicate the importance of 18 general goals and values (e.g., creating artistic work, being very well off financially). Four scales, parallelling the four subenvironments, were created and used as covariates in the analyses. The four 1986 scales and their reliability estimates are presented in Table 2. The reliability estimates range from .67 to .75; and the correlations among the four scales range from .04 to .39. Thus, the four 1986 scales appear to be reasonably reliable and independent measures of students' predispositions to the four academic subenvironments prior to college enrollment.

(Insert Table 2 about here)

Analyses. A 4 x 3 x 2 multivariate analysis of covariance (MANCOVA) design was used to analyze the data. The covariates (see Table 2) were the four 1986 precollege scales reflecting students' predispositions to the four academic subenvironments. The three independent variables were: Holland's academic subenvironments (4 levels: Investigative, Artistic, Social, Enterprising); Carnegie institution type (3 levels: Research and Doctoral Granting Universities, Comprehensive Colleges and Universities, Liberal Arts Colleges) and duration of exposure (2

levels: consistent 1986-90 majors, inconsistent 1986-90 majors). The dependent variables (see Table 3) were the 18 items in the 1990 follow-up survey reflecting students' self-reported growth between 1986 and 1990.

Results

The overall MANCOVA test of the within-cells regression effect was statistically significant ($F(72/7976) = 6.50$, $p < .001$), indicating that students' self-reported growth in 1990 was significantly related to their scores on the four covariates. Students' scores on the 18 dependent variables were then adjusted to control for their precollege predispositions toward each of the four academic subenvironments through standard regression procedures. The resulting adjusted mean scores for the dependent variables are the scores that would be expected or predicted for students in each of the four subenvironments if the covariate means for the groups were the same as the grand mean for all students on each covariate (Huitema, 1980).

The MANCOVA results indicate that none of the interaction terms were close to being statistically significant (subenvironment by institution by duration: $F = 0.74$; institution by duration: $F = 0.92$; subenvironment by duration: $F = 1.17$; subenvironment by institution: $F = 1.01$). However, the Holland academic subenvironment main effect was statistically significant ($F(54/5969) = 4.35$, $p < .001$) indicating wide variation among the four subenvironments in students' self-reported growth over the four-year period when controlling for their 1986 precollege predispositions to those four subenvironments.

Discriminant analysis procedures may be used in conjuntion with MANCOVA designs to assist in characterizing significant main effect differences when the interaction term(s) fails to reach statistical significance (Bock & Haggard, 1968). The three discriminant functions in the academic subenvironment main effect were statistically significant ($p < .001$). These discriminant functions permit parsimonious interpretations of the "dimensions" along which groups differ (Tatsuoka, 1971).

The nature of the dimension measured by each of the three significant discriminant functions may be determined by inspection of the standardized discriminant weights and the

correlations of items and discriminant function scores presented in Table 3. The discriminant weights represent the relative contribution of each variable to the interpretation of each discriminant function; while the correlations reflect the association of each of the eighteen items with the score on the discriminant function with which they are most highly associated.

(Insert Table 3 about here)

The first discriminant function is bipolar. The positive end reflects students' self-reported leadership, career, and interpersonal growth, whereas the negative end reflects growth in their preparation for graduate or professional school. For example, students with high scores on this function report more growth in "job-related skills," "public speaking ability," competitiveness," and "leadership abilities," whereas those with low scores report more growth in terms of "preparation for graduate and professional school". Accordingly, the first discriminant function is entitled "Career and Leadership Growth".

The second discriminant function is similarly bipolar with the positive end (high scores) defined by self-reported growth in "writing skills," "cultural awareness and appreciation," and "abilitity to think critically," whereas the negative end (low scores) is defined by growth in "analytical and problem solving skills". The second function is labelled "Artistic and Cultural Growth" given these characteristics.

The third discriminant function reflects general "Educational and Social Growth". High scores on this function reflect greater self-reported growth in terms of "interest in pursuing a graduate/professional degree," "confidence in your academic abilities," "acceptance of people from different races/cultures," and "tolerance of persons with different beliefs".

Table 4 presents the raw and adjusted mean scores for students in the four academic subenvironments on the three discriminant functions described above. Bryant-Paulson post hoc pairwise comparison procedures (Stevens, 1996) were used to examine the statistical significance of differences among the means of the four groups of academic majors. Students in

Enterprising subenvironments (adjusted mean = 0.51) have significantly higher scores on "Career and Leadership Growth" than students from all other subenvironments, and students from Investigative subenvironments have a significantly lower adjusted mean score (- 0.27) than students from all other subenvironments. Students from Artistic subenvironments have a significantly higher adjusted mean score (0.38) and those from Investigative subenvironments have a significantly lower adjusted mean score (- 0.25) than students from the other subenvironments on the second discriminant function, "Artistic and Cultural Growth". Finally, those from Social subenvironments have a significantly higher adjusted mean score (0.15) and those from Artistic environments have a significantly lower adjusted mean score (- 0.21) on "Educational and Social Growth". It should be remembered that these differences exist when controlling for students' precollege predispositions to the four academic subenvironments.

(Insert Table 4 about here)

Discussion

Kelly and Hart (1971) and Lipset and Ladd (1971) suggested that the influence of academic departments on students is a consequence of two underlying components: the first is a selective recruitment process of distinctive personality types in which departments attract students with "desired" attributes, the second is a socialization process in which departments reinforce and reward students for the display of attitudes, values, and competencies that are in accordance with their respective prevailing orthodoxies, biases, and definitions of the right way to think and act. A central premise of Holland's theory is that distinctive subenvironments within broader educational and occupational settings encourage, reinforce, and reward distinctive attitudinal and behavioral patterns. The findings of the current study provide strong support for the validity of this fundamental premise by demonstrating wide variation in self-reported patterns of growth over a four-year period for college students in four such

subenvironments, when controlling for their precollege predispositions to those subenvironments. Three aspects of the findings from the current study merit particular attention.

First, the general validity of the premise above is further supported by the fact that the substantive nature of the differences obtained is highly consistent with the fundamental tenets of the theory. For example, students whose undergraduate preparation is in Enterprising subenvironments report greater growth in "Career and Leadership Growth" than those in other subenvironments. This finding is highly consistent with the distinctive emphasis in Enterprising subenvironments on the value of economic achievements and the fostering of leadership, interpersonal, and persuasive competencies for the attainment of organizational goals and economic gain (see Table 1). Similarly, the findings that those whose preparation is in Artistic subenvironments report greater growth in "Artistic and Cultural Growth," those whose preparation is in Social subenvironments report greater growth in "Educational and Social Growth," and those from Investigative subenvironments report less growth in career development and more growth in terms of preparation for graduate or professional school are consistent with the distinctive nature of these subenvironments shown in Table 1. For example, the higher score of students whose preparation is in Social subenvironments on "Educational and Social Growth" is consistent with the prevailing emphasis on educational, social, and ethical activities and problems in that subenvironment.

Second, the findings of this study are consistent with those reported by Smart (1985) in demonstrating that differences among students whose undergraduate preparation is in one of these four subenvironments are equally true for those attending different kinds of colleges and universities. This finding is important given the paucity of existing tests of the generalizability of Holland's theorems across different institutional settings (e.g., research universities versus liberal arts colleges), and suggests that the applicability of Holland's theory is equally valid in decidedly different types of colleges and universities.

Third, the findings of this study demonstrate that differences in students' self-reported growth is more a function of the specific academic subenvironment within individual institutions

in which they receive their undergraduate preparation than the overall type of institution attended. That is, student self-reports of growth over the four-year period are more related to the collective influence of the specific academic subenvironments within institutions than the general type of college or university they attend. This suggests that those who study the effects of colleges on students would be advised to focus their attention more on factors within individual campus settings, such as academic departments, that are logically and theoretically related to differential patterns of students' growth than to general, between institution characteristics (e.g., size, control, selectivity) that have little or no theoretical grounding.

There is a need, as noted by Baird (1988), to redirect research toward an understanding of subenvironments within broader institutional settings given the growing appreciation that contemporary diversity in American higher education is increasingly found within rather than between colleges and universities. The findings of this study, in conjunction with those of Astin (1965), Hearn and Moos (1978), Peters (1974), and Smart (1982, 1985), and Walsh, Vaudrin, and Hummel (1972), clearly support the merits of Holland's theory as a conceptual framework to guide research on the internal diversity of colleges and universities.

There is abundant evidence, for example, that the effectiveness of alternative instructional approaches varies according to students' personality types (Perry & Dickens, 1984; Perry & Magnusson, 1987; Perry & Tunna, 1988). The academic subenvironments proposed by Holland are based on student and faculty personality types, and thus Holland's theory has considerable potential to advance understanding of the differential contribution of different instructional approaches to students' learning and cognitive development within these specific academic subenvironments.

In addition to this specific suggestion regarding the potentially differential effectiveness of alternative instructional approaches in these particular academic subenvironments, there is a general need for research to examine other mechanisms by which the subenvironments reinforce and reward the characteristic patterns of interests, attitudes, and competencies of their associated personality types. Such inquires might focus on differences in the relative importance of

alternative undergraduate educational goals of faculty in these academic subenvironments and the amount and nature of student-faculty interactions given the findings of Vreeland and Bidwell (1966) and Parsons and Platt (1973). In sum, there is growing evidence that the academic subenvironments proposed by Holland (1973, 1985) do, in fact, reinforce and reward different patterns of interests and abilities. The primary agenda for future research is to discern the specific socialization mechanisms used in these disparate academic subenvironments to promote the differential patterns of interests, attitudes, and competencies of their associated personality types.

Limitations

A substantial limitation of the current study is the unknown validity of the self-perceived measures used in the analyses. There is some evidence, available upon request, that the measures employed have reasonable construct validity. For example, the four measures used to assess students' precollege predispositions to the four academic subenvironments (see Table 2) do discriminate in a manner consistent with the premises of Holland's theory. That is, students who select Investigative majors have a significantly higher mean score on the 1986 Investigative subenvironment scale, whereas students who select Enterprising majors have a significantly higher mean score on the 1986 Enterprising subenvironment scale. In addition, the unadjusted means of students majoring in the four academic subenvironments (see Table 4) differentiate in a manner consistent with the premises of Holland's theory. For example, students who select Enterprising majors have a significantly higher unadjusted mean score on Career and Leadership Growth, whereas students who select Artistic majors have a significantly higher unadjusted mean score on Artistic and Cultural Growth. This pattern of theoretically consistent differentiation provides partial empirical support for the construct validity of both the 1986 precollege predisposition and 1990 self-perceived growth measures.

Ewell, Lovell, Dressler, and Jones (1994) specifically identifed the CIRP as an instrument that has reasonably well established validity for use in the study of institutional "good practice" indicators and student growth. Their conclusion is based in part on Astin's (1993)

results showing that CIRP experience and environment items are related in an expected mannner to GRE and LSAT residual scores (when controlling for SAT scores), and Anaya's (1992) validation of CIRP self-report items through his demonstration of their empirical linkages to results obtained from direct cognitive assessments.

While Pike (1995) provided considerable evidence from the use of confirmatory factor analysis procedures that students' self-reports of cognitive growth during college do converge with College Base test scores, he cautioned that there is a need for further research on the relationship between content correspondence and convergence before self-reported data can be fully accepted as "valid proxies or policy indicators" (p. 19). This caution is appropriate in considering the validity of the findings derived from the current study.

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Table 1

FOUR ACADEMIC SUBENVIRONMENTS FROM HOLLAND'S THEORY

INVESTIGATIVE subenvironments place great emphasis on *activities* that involve the observational, symbolic, systematic, and creative investigation of physical, biological, and cultural phenomena in order to understand and control such phenomena, and devote little attention to persuasive, social, and repetitive activities. These behavioral tendencies in Investigative subenvironments lead, in turn, to the acquisition of scientific and mathematical *competencies* and to a deficit in persuasive and leadership abilities. Students in Investigative subenvironments are encouraged to *perceive themselves* as cautious, critical, complex, curious, independent, precise, rational, and scholarly, and to *value* science and scholarship. Representative *disciplines* include Economics, Mathematics, Statistics, Anthropology, Astronomy, Chemistry, Physics, Biology, Dentistry, Science education, Experimental psychology, Pharmacy, Geology, Agronomy, Animal science, Biochemistry, Botany, Zoology, Geography, Aeronautical engineering, Chemical engineering, Civil engineering, and Electrical engineering.

ARTISTIC subenvironments place great emphasis on ambiguous, free, and unsystematized *activities* that involve the manipulation of physical, verbal, or human materials to create art forms or products, and devote little attention to explicit, systematic, and ordered activities. These behavioral tendencies in Artistic subenvironments lead, in turn, to the acquisition of artistic *competencies* -- language, art, music, drama, writing -- and to a deficit in clerical and business system competencies. Students in Artistic subenvironments are encouraged to *perceive themselves* as expressive, original, intuitive, nonconforming, introspective, independent, emotional, and sensitive, and to *value* esthetic qualities. Representative *disciplines* include Drama, English, English education, Theatre arts, Philosophy, Art, Art, Music, Interior decorating, and Architecture.

SOCIAL subenvironments place great emphasis on *activities* that involve the manipulation of others to inform, train, develop, cure, or enlighten, and devote little attention to explicit, ordered, systematic activities involving materials, tools, or machines. These behavioral tendencies in Social subenvironments lead, in turn, to the acquisition of human relations *competencies* (e.g., interpersonal and educational skills) and to a deficit in manual and technical competencies. Students in Social subenvironments are encouraged to *perceive themselves* as cooperative, empathetic, generous, helpful, idealistic, responsible, tactful, understanding, and warm, and to *value* social, educational, and ethical activities and problems. Representative *disciplines* include History, Political science, Sociology, Nursing, Social work, Educational administration, Physical therapy, Counselor education, Elementary education, Library science, and Special education.

ENTERPRISING subenvironments place great emphasis on *activities* that involve the manipulation of others to attain organizational goals or economic gain, and devote little attention to observational, symbolic, and systematic activities. These behavioral tendencies in Enterprising subenvironments lead, in turn, to an acquisition of leadership, interpersonal, speaking, and persuasive *competencies* and to a deficit in scientific competencies. Students in Enterprising subenvironments are encouraged to *perceive themselves* as aggressive, ambitious, domineering, energetic, extroverted, optimistic, popular, self-confident, sociable, and talkative, and to *value* political and economic achievements. Representative *disciplines* include Insurance and banking, Public administration, Business management, Marketing and sales, Law, Industrial engineering.

Source: Rosen, D., Holmberg, K., and Holland, L. (1989). The college majors finder. Odessa, FL: Psychological Assessment Resources.

Table 2

1986 SCALES OF PRECOLLEGE PREDISPOSITIONS TO THE FOUR ACADEMIC SUBENVIRONMENTS

Investigative Subenvironment Scale. A three-item scale reflecting students' precollege self-ratings of their "academic ability," "mathematical ability," and "intellectual self-confidence" in comparison to their peers. (Coefficient Alpha = 0.68)

Artistic Subenvironment Scale. A six-item scale reflecting students' precollege self-ratings of their "artistic ability" and "writing ability," and the importance they attached in 1986 to "becoming accomplished in one of the performing arts," "writing original works," "creating artistic work," and "developing a meaningful philosophy of life". (Coefficient Alpha = 0.67)

Social Subenvironment Scale. A six-item scale reflecting the importance students' attached in 1986 to "influencing the political structure," "influencing social values," "helping others who are in difficulty," "becoming involved in programs to clean up the environment," "participating in a community action program," and "helping to promote racial understanding". (Coefficient Alpha = 0.75)

Enterprising Subenvironment Scale. A six-item scale reflecting students' precollege self-ratings of their "leadership ability" and "intellectual self-confidence," and the importance they attached in 1986 to "being very well off financially," "having administrative responsibility for the work of others," "becoming successful in a business of my own," and "becoming an expert on finance and commerce". (Coefficient Alpha = 0.68)

Table 3

STANDARDIZED DISCRIMINANT WEIGHTS AND ITEM CORRELATIONS

Discriminant Functions & Associated Variables	Standardized Discriminant Weights	Item Correlation with Function
Function #1 Items and Title:	*"Career and Leadership Development"*	
"Preparation for graduate or professional school"	-.72	-.59
"Job-related skills"	.44	.44
"Public speaking ability"	.24	.40
"Competitiveness"	.28	.39
"Leadership abilities"	.16	.31
"Ability to work cooperatively"	-.07	.24
"Interpersonal skills"	.17	.23
Function #2 Items and Title:	*"Artistic and Cultural Development"*	
"Writing skills"	.50	.46
"Analytical and problem solving abilities"	-.65	-.37
"Cultural awareness and appreciation"	.27	.34
"Ability to think critically"	.30	.20
Function #3 Items and Title:	*"Educational and Social Development"*	
"Interest in pursuing a graduate/professional degree"	.53	.58
"Confidence in your academic abilities"	.42	.35
"Foreign language ability"	-.35	-.33
"Acceptance of people from different races/cultures"	.23	.31
"Tolerance of person with different beliefs"	.27	.30
"Religious beliefs and convictions"	.14	.21
"Ability to work independently"	.11	.18

Note 1: Respondents were asked: "Compared with when you entered college as a freshman, how would you describe your: " A five-point response scale was used with 5 = "much stronger," 4 = "stronger," 3 = "no change," 2 = "weaker," and 1 = "much weaker".

Note 2: Standardized discriminant weights represent the relative contribution of each variable to the interpretation of the discriminant function; the correlation coefficients are between the individual items and the resultant scores on the discriminant function with which they are primarily associated (e.g., "job-related skills" correlates 0.44 with scores on the first discriminant function; "writing skills correlates 0.46 with scores on the second discriminant function).

Table 4

RAW AND ADJUSTED MEANS OF HOLLAND'S FOUR ACADEMIC SUBENVIRONMENTS ON THE THREE DISCRIMINANT FUNCTIONS

	Holland Academic Subenvironments			
Discriminant Functions	Investigative	Artistic	Social	Enterprising
Career and Leadership Growth	- 0.27 (- 0.29)	- 0.07 (- 0.15)	- 0.06 (- 0.04)	0.51 (0.58)
Artistic and Cultural Growth	- 0.25 (- 0.32)	0.38 (0.52)	0.14 (0.13)	- 0.11 (- 0.13)
Educational and Social Growth	- 0.02 (- 0.06)	- 0.21 (- 0.24)	0.15 (0.18)	- 0.09 (- 0.07)

Note: The discriminant function scores are standardized with a mean of "0" and a standard deviation of "1". The raw mean scores are presented in parentheses and represent the actual mean scores of students in the four academic subenvironments on the three discriminant functions. The adjusted mean scores for students in the four academic subenvironments on the three discriminant functions control for students' scores on the four covariates used in the analyses (see Table 2).